REMARKS

Favorable reconsideration of this Application as presently amended and in light of the following discussion is respectfully requested.

After entry of the foregoing Amendment, Claims 2-15, 17-20 and 24-28 are pending in the present Application. Claim 25 is amended to address a cosmetic matter of form. Claims 21-23 are cancelled without prejudice or disclaimer. No new matter has been added.

By way of summary, the Official Action of November 3, 2006 presents the following issues: Claims 5-7, 14, 18, 20 and 21-28 stand rejected under 35 U.S.C. § 102 as being anticipated by Espax et al. (U.S. Patent No. 6,373,433, hereinafter "Espax"); Claims 6, 7, 14, 18 and 21-26 stand rejected under 35 U.S.C. § 102 as being anticipated by Greenstein et al. (U.S. Patent No. 6,131,016, hereinafter "Greenstein"); Claims 8 and 19 stand rejected under 35 U.S.C. § 103 as being unpatentable over Greenstein or Espax and further in view of Minami et al. (U.S. Patent No. 6,587,510, hereinafter "Minami"); Claims 15 stands rejected under 35 U.S.C. § 103 as being unpatentable over Greenstein or Espax in further view of Ocenasek et al. (U.S. Patent No. 6,674,324, hereinafter "Ocenasek"); and Claims 2-4, 9-13 and 17 are objected to as being dependent upon a rejected base claim.

Applicants appreciatively acknowledge the indication of allowable subject matter recited in Claims 2-4, 9-13 and 17. However, as Applicants submit that the independent claims patently define over the applied references, these dependent claims are maintained in their present form.

REJECTION UNDER 35 U.S.C. § 102

The outstanding Official Action has rejected Claims 5-7, 14, 18, 20 and 21-28 under 35 U.S.C. § 102 as being unpatentable over Espax. The Official Action contends that Espax

discloses all of the Applicants' claimed features. Applicants respectfully traverse the rejection.

Applicants' Claim 24, recites, *inter alia*, a method for transmitting orthogonal frequency division multiplex (OFDM) symbols to be transmitted by using a plurality of OFDM subcarriers in an OFDM transmission system, the method including:

> . . . obtaining subcarrier channel response vectors corresponding to said plurality of antenna elements, wherein each of said subcarrier channel response vectors has subcarrier related elements corresponding to said plurality of subcarriers, and
>
> applying weighting value to each of said plurality of subcarriers of said OFDM symbols in accordance with a complex conjugate of said obtained subcarrier channel response vectors. (emphasis added)

Espax describes a communication system including a first communication device (1) and a second communication device (2) that communicate via a wireless link (3). The communication devices communicate via an OFDM multi carrier modulation scheme.[1] The transmission path embodied by wireless link (3) will have a characteristic channel response which will affect the amplitude and phase of each sub-carrier transmitted from the communication device (1). In this regard, the communication device (1) is configured to generate probe symbols for reception and analysis by the second communication device (2) the probing symbols are provided to a controller (18) by the second communication device (2) to determine an optimum weight for each subcarrier corresponding to the transmitted probe symbols. In this way, the communication device (2) can select those sub-carriers whose received signal quality is comparatively poor. A channel estimator (19) estimates the channel response of the transmit path by analysis of the received probe symbol transmissions.[2] The subbands containing the selected sub-carriers having poor quality are in this way identified via a transmission from a transmitter (14) of communication device (2) to

[1] See Espax at column 4, lines 12-29.
[2] See Espax at column 5, line 30-67.

communication device (1) and include a request for probing signals on just one sub-carrier in each selected subband. The communication device (1) responds to communication device (2) by transmitting probe signals including pilot symbols in order to probe the wireless link (3) for all the antennas (4-6) in the sub-band specified by the communication device (2).[3]

Conversely, in an exemplary embodiment of the Applicants' claimed advancements, a method of transmitting orthogonal frequency division multiplex (OFDM) symbols transmitted using a plurality of OFDM subcarriers in an OFDM transmission system, is provided. OFDM symbols are generated to be transmitted by using a plurality of antenna elements. Subcarrier channel response vectors are obtained corresponding to the plurality of antenna elements. Each of the subcarrier channel response vectors has subcarrier related elements corresponding to the plurality of subcarriers. A weighting value is applied to each of the subcarriers of the OFDM symbols in accordance with a complex conjugate of the obtained subcarrier channel response vectors.

As can be appreciated, as Espax only adjusts sub-carriers of probed sub-bands, which have been identified through an exchange of signals between a communication device (1) and a communication device (2) for identifying poor quality sub-carriers. Espax does not disclose or suggest applying a weighting value to each of said plurality of subcarriers of said OFDM symbols in according with a complex conjugate of the obtained subcarrier channel response vectors as recited in Applicants' Claim 24.

Applicants' Claim 25 recites, *inter alia*, a method which transmitting an orthogonal frequency division multiplex (OFDM) signal by using a plurality of antenna elements in a wireless transmission system, while an OFDM signal comprises a plurality of subcarriers, the method including:

[3] See Espax at column 6, lines 5-12.

> detecting frequency channel characteristics of each subcarrier of the OFDM signal for each of said plurality of antenna elements,
>
> adjusting at least one of the amplitude and phase of each subcarrier in accordance with the detected characteristics of the corresponding subcarrier frequency channel or all subcarrier frequency channels, and
>
> transmitting the OFDM signal by using the adjusted subcarriers via said plurality of antenna elements. (emphasis added)

As noted above, Espax does not disclose or suggest adjusting the amplitude and phase of each subcarrier as Espax only describes the adjustment of sub-carriers of probe-subbands which are identified as including sub-carriers of a poor quality. For example, Espax does not disclose adjusting the amplitude and phase of each-subcarrier of sub-bands including sub-carriers of a good quality which are necessarily omitted from the Espax design.

Moreover, Espax does not anticipate the feature of pending Claim 25 of adjusting the amplitude/phase of each sub-carrier in accordance with the detected characteristics of sub-carrier frequency channel/channels. The first communication device 1 indeed modifies sub-carriers in accordance with weight values received from the second communication device (2) (column 6, lines 16-18). The adjustment of the amplitude/phase by the first communication device (1) is therefore not carried out depending on detected channel characteristics, but is performed on the basis of already computed weight values.

Additionally, Espax does not teach adjusting the sub-carrier in accordance with detected channel characteristics, because it is only stated that the second communication device (2) "determines the preferred weight vector to be applied for each probe sub-band", column 6, lines 14 to 16. The weight values are thus determined for each probed sub-band, but neither in accordance with each probed sub-band nor in accordance with the detected channel characteristics of each probed sub-band.

With regard to independent Claim 26, Applicants note that the Applicants' claimed advancements are directed to implicit beam forming, Claim 26 requires that the same communication device detects the frequency channel characteristics perform the adjustment

of the amplitude-phase of subcarriers. As can be appreciated from review of Espax, the Espax system describes an explicit beam forming system in which the receiving device performs the detection. Accordingly, in addition to the distinctions noted above, Applicants respectfully submit that Clam 26 is further distinguished for this implicit beam forming configuration.

Accordingly, Applicants respectfully request that the rejection of Claims 5-7, 14, 18, 20 and 21-28 under 35 U.S.C. § 102 be withdrawn.

The Official Action has rejected Claims 6, 7, 14, 18 and 21-26 under 35 U.S.C. § 102 as being unpatentable over Greenstein. The Official Action contends that Greenstein describes all of the Applicants' claimed features. Applicants respectfully traverse the rejection.

Greenstein describes a system for transmitting multi-carrier OFDM signals, including pilot tones. As shown in Fig. 2B, the downlink receiver, or terminal, performs differential phase detection of successive received pilot tones. In operation, the receiving terminal compares the strength of successive received pilot tones, and, determines which of the channels, that is the air channels associated with the respective transmit antenna, is currently carrying the stronger pilot tone. The terminal then sends this information back to the base station to select a corresponding transmission antenna.[4] As the pilot channel is representative of a cluster of subcarriers, the phase adjustment process is performed with respect to the propagation channels depending on the detected phase of the pilot tone. As shown in Fig. 2A, the weighting factors (w1) and (w2) are single values, which are applied to the propagation channel as a whole.

Conversely, in an exemplary embodiment of the Applicants' advancements, a transmission system is provided, in which signals are received through a plurality of antenna

[4] Greenstein at column 4, lines 53-63.

elements via a plurality of subcarriers. Each of the subcarrier transmission characteristics are adjusted in accordance with a detected subcarrier channel response vector. In this way, the subcarrier characteristics (e.g., phases) are adjusted to reduce multipath fading in the multicarrier transmission system.

In the Official Action of November 3, 2006 reference was made to column 5 line 45 through column 6 line 10, which was alleged as describing the detection of frequency channel characteristics of each sub-carrier of OFDM signal, Applicants note that this is not the case. While it may be the case that some of the tones are outside of the correlation bandwidth. In this case it is proposed to group the tones outside of the correlation bandwidth and to select a further pilot tone in the second group of tones outside of the correlation bandwidth. Therefore, there will be two pilot tones and the channel characteristics of only two tones is detected while the channel characteristics of other tones of the two groups is not detected. Additionally, as noted above, Claim 26 recites implicit beam forming (i.e., detection and adjustment is performed at a single device) as such, this claim is allowable for this further distinction in addition to that noted above. As Greenstein does not disclose, or suggest, adjusting individual subcarrier characteristics of a multicarrier transmission system based upon obtained vector elements of each subcarrier, but, instead, a pilot tone, which provides values for adjusting the entirety of a cluster, Applicants respectfully submit that Applicants' amended Claim 24, 25 and 26 and any claim depending therefrom is patentably distinguished over the cited reference.

Accordingly, Applicants respectfully request that the rejection of Claim 6, 7, 14, 18, and 21-26 under 35 U.S.C. § 102 be withdrawn.

The Official Action has rejected Claims 8 and 19 under 35 U.S.C. § 103 as being unpatentable over Greenstein or Espax in view of Minami. The Official Action contends that

Greenstein or Espax discloses all of the Applicants' claim limitations, with the exception of limiting an adjustment of the magnitude of a sub-carrier signal to an upper threshold. However, the Official Action cites Minami as disclosing this feature of the Applicants' claim and states that it would have been obvious to one of ordinary skill in the art to combine the cited references for arriving at the Applicants' claims. Applicants respectfully traverse the rejection.

As noted above, neither Greenstein nor Espax discloses all of the elements of the Applicants' claims for which they have been asserted. As Minami does not remedy the deficiency discussed above, Applicants respectfully submit that a *prima facie* case of obviousness has not been presented.

Accordingly, Applicants respectfully request that the rejection of Claims 8 and 19 under 35 U.S.C. § 103 be withdrawn.

The Official Action has rejected Claim 15 under 35 U.S.C. § 103 as being unpatentable over Greenstein or Espax in view of Ocenasek. The Official Action contends that Greenstein or Espax disclose all of the Applicants' claim limitations with the exception of a software implementation. However, the Official Action cites Ocenasek as describing this more detailed aspect of the Applicants' claim, and states that it would have been obvious to one of ordinary skill in the art to combine the cited references for arriving at the Applicants' claims. Applicants respectfully traverse the rejection.

As noted above, neither Greenstein nor Espax discloses, or suggests, all of the elements for which they have been asserted. As Ocenasek does not remedy the deficiency discussed above, Applicants respectfully submit that a *prima facie* case of obviousness has not been presented.

Accordingly, Applicants respectfully request that the rejection of Claim 15 under 35 U.S.C. § 103 be withdrawn.

CONCLUSION

Consequently, in view of the foregoing amendment and remarks, it is respectfully submitted that the present Application, including Claims 2-15, 17-20 and 24-28, is patently distinguished over the prior art, in condition for allowance, and such action is respectfully requested at an early date.

Respectfully submitted,

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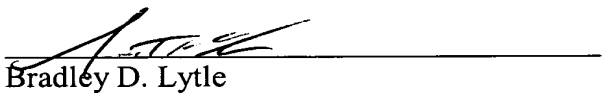

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